

Water System Compliance

Definition: The Department of Health issues public water system operating permits annually, according to regulations promulgated by the State Board of Health in chapter 246-294 WAC. The permit process includes an evaluation of each water system's capability to provide safe and adequate drinking water to the public.

Summary

A wide variety of diseases can be spread by contaminated drinking water. Some contaminants produce illness only after long-term exposure; others result in a rapid onset of illness.

The Department of Health's operating permit process evaluates water systems' capability to provide safe and adequate drinking water to the public. During 1995, 2,857 of Washington's public water systems were evaluated for operating permits, and 553 of these systems serving about 80,000 people were determined to be lacking the capabilities to adequately protect drinking water and prevent potential public health problems. However, even water systems with adequate capabilities can fail to prevent potential public health problems.

Time Trends

Legislation passed in 1991 required that all public water systems with 15 or more connections obtain annual operating permits. The operating permit process involves evaluating the performance of a water system in relation to potential public health impact. For example, criteria have been established to evaluate water quality, treatment performance, system operation, management, and training of personnel. Essentially, the operating permit is a report card on

the water system's ability to provide safe and adequate drinking water. Annually, DOH evaluates and categorizes each water system's compliance with significant public health requirements. In 1993, the first complete year of operating permit evaluation, 78% of the systems were evaluated as capable of providing adequate protection. By 1995, this percentage had increased to 87%.

Year 2000 Goal

The state's goal is that 95 percent of all systems will comply with operating permit criteria by the year 2000. Since the permit process has been operating for only a few years, we do not have sufficient data to determine the chances of reaching that goal.

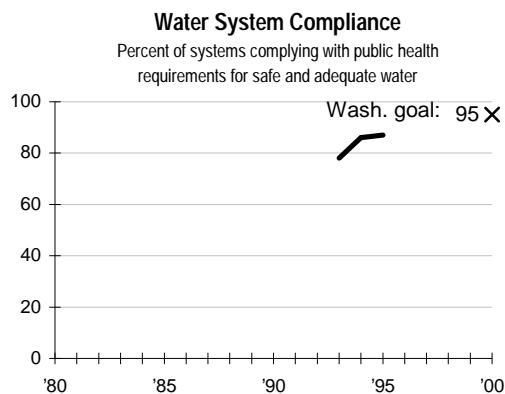
Geographic Variation

All areas of the state have public water system noncompliance and potential public health problems related to water systems.

Measures of Impact and Burden

The objective in providing safe and reliable drinking water is to protect the public's health. Inadequate protection of drinking water may lead to contaminated water, and ultimately result in illness among people drinking unsafe water.

Diseases. The potential illnesses related to drinking water are primarily the result of contaminants that are often spread simultaneously through a variety of ways, such as food, water, and air. There are few diseases that are spread only by drinking water. In addition, the symptoms of waterborne diseases are similar to many other common illnesses such as gastroenteritis or food poisoning. It is also difficult to trace the cause of a person's illness to a single contaminant. For these and other reasons, it is extremely difficult to attribute a disease to water quality with absolute certainty. For the year 1995, there were no waterborne disease outbreaks recorded statewide. Nonetheless, it is likely that some did occur.



Microorganisms. Of the many disease-causing organisms that can affect water quality, most are introduced into water by man and warm-blooded animals. However, there is no viable method to routinely analyze drinking water for all the organisms which can cause diseases. Coliform bacteria, which are readily detectable, are used as an indicator of potential contamination by disease-causing organisms.

During 1995, fecal coliform contamination occurred in 228 public water systems in Washington. Thirty-two of these systems were determined to be incapable of providing safe drinking water to their customers and were categorized as inadequate by the operating permit evaluation. The remaining 196 systems were capable of providing safe drinking water, but failed to prevent problems which are a risk to the public's health. The 228 systems served a total of 600,000 people, or 11.5% of Washington residents. Rapid resolution of the cause of the contamination is a high priority. As long as contamination persists, the drinking water is not considered safe.

Nitrates. High levels of nitrates in drinking water can lead to a blood disorder often referred to as 'blue baby syndrome', or methemoglobinemia. This disease interferes with the capacity of the blood to transport oxygen to the organ systems. It principally impacts the health of infants.

Nitrates enter drinking water from contamination of the water source by fertilizer, solid waste (sewage), decomposing vegetation, or natural geologic formations. Often other contamination accompanies nitrates. 54 systems have been evaluated as having nitrate exceeding the maximum contaminant levels. All these water systems are very small and serve a total of about 4000 people, and most are located in eastern Washington. The emergence of high nitrate levels in these water systems indicates potential contamination problems in an aquifer that supplies a major portion of eastern Washington.

Lead. Lead can affect mental development of young children. It can enter drinking water from the plumbing in homes and buildings. When lead is present in fixtures and pipe solder, it may leach out under certain water conditions. The amount of lead leached into the water is very low and not a critical problem by itself, but it can be a significant contributing factor when there are other routes of

exposure to lead. A total of 84 public water systems, which serve 31% of Washington residents or 1.7 million people, have exceeded the health advisory level established by the Environmental Protection Agency.

Industrial and household chemicals. A variety of industrial and household chemicals, mostly solvents and degreasers, have recently been detected in approximately 10% of Washington's drinking water supplies. Some of these volatile organic chemicals damage the liver, nervous system, and circulatory system in humans. Most of the contaminants were found in low concentrations. Only 2% of the sources had contamination at or near the level for health concern. Analyzing drinking water for volatile organic chemicals is a recent program and the trend is unknown. Several intervals of sample collection will be necessary to determine if contamination is an increasing problem.

DOH has investigated 1200 water sources for a variety of synthetic organic chemicals, most of which are pesticides. Statewide, contamination was detected in less than 7% of the sites, and no samples analyzed were near the health advisory level. A few areas with a higher detection rate were identified and are under further investigation.

Unidentified contaminants. Each year, many new substances capable of contaminating drinking water supplies are developed for household and industrial use. While surveillance for known contaminants continues among public drinking water supplies, not enough is known to evaluate these new potential contaminants.

The best health protection is to resolve the underlying problems that contribute to potential contamination. Most of the drinking water contamination in Washington results from faulty operation of the water system, sanitary defects in system facilities, unprotected or vulnerable water sources, and inadequate cross-connection control. Of the water systems determined to be inadequate during the 1995 operating permit evaluation, approximately 50% had contamination which was a risk to public health.

Risk and Protective Factors

A variety of problems can reduce a system's capacity to provide safe and reliable drinking water. The protection of public health is focused on the prevention of underlying causes.

Water Resources. An uninterrupted and adequate supply of water is necessary to provide for basic public health needs such as drinking, cooking and normal hygiene. If the supply is not dependable, people may turn to other water sources that may be unsafe and threaten their health. In addition, a reliable source is needed to maintain enough pressure to prevent backflow contamination and to ensure enough water for firefighting purposes.

In 1995, 89 public water systems serving a total of nearly 30,000 people were found to have exceeded their ability to provide a sufficient quantity of drinking water to their customers.

Proper planning by public water systems is critical for meeting current and projected water needs. Before increased demands for water consumption are made on a water system, through new residential or commercial activity, a reliable supply of water must be assured. It is important to have the legal authority to use the water. In 1995 382 public water systems, serving nearly 35,000 people, did not secure an adequate water supply prior to pursuing construction or expansion.

Source Protection. Reducing the health risks associated with a contaminated source of drinking water through water treatment or source replacement can be very expensive and sometimes impossible. To preserve a safe drinking water supply, sources must be protected before they become contaminated.

Source protection includes identifying the potential contaminants for each source of supply and managing them to minimize future pollution problems that might affect community drinking water supplies. Approximately 10 percent of the drinking water sources statewide already have indications of contamination. The potential for contamination exists with many others due to inadequate source protection.

Cross-Connection Control. A cross-connection is a link between the distribution piping of a public water system and piping that may contain a contaminant. When the normal flow in the water system reverses, a cross-connection can allow contaminants into drinking water. As many as half of all reported disease outbreaks associated with drinking water are caused by cross-connection with contaminated or unsafe water.

In 1994, a survey of Washington's water systems serving 100 or more connections indicated

that 58 percent did not have an active program to prevent or control cross-connections. DOH estimates that more than 1 million people are served by water systems with inadequate cross-connection control programs.

Technical Investigations. Contamination, poor water quality, and unreliable service predominantly result from faulty operational practices and sanitary defects in water system facilities. These conditions, which are a health risk to those drinking the system's water, can frequently be identified by routine inspection of water system facilities. Well-directed technical investigations can help a water system identify and resolve problems before significantly risking the public's health.

During 1995, 82 public water systems, serving a total of 17,000 people, had sanitary and operational defects that posed excessive risks to public health. Identification and correction of these problems through technical investigations reduces both current and future risk.

Fiscal Viability. A public water system must have the financial capacity to support continued operation and long-term development. Without sufficient capital, a system may not be able to finance public health protection facilities or to supply safe and reliable drinking water.

The Department of Health conducted an assessment of the capital and non-capital needs for public water systems in Washington in 1992. The estimated total cost for repair, replacement and growth would be about \$2.22 billion for 1993 through 1999. An additional \$205 million in operational costs related to federal Safe Drinking Water Act requirements was not included in that estimate. To accommodate growth associated with Growth Management Act plans, an estimate totaling over \$1 billion in water system capital costs is anticipated for the year 2000.

There is a wide gap between the amount of available funding and the documented need. In addition, many small water systems that are most in need do not meet the eligibility conditions for existing funding programs.

High Risk Systems

A viable public water system is self-sustaining, has a reliable water supply, and has the managerial, technical, operational and financial

capabilities to consistently provide safe drinking water on a long-term basis.

Small Water System. Very small water systems (those with fewer than 100 connections) are least capable of maintaining primary protections and represent the most significant risk group. Such systems serve less than 5% of the state's population but constitute 83% of the total number of systems. Of 553 public water systems evaluated as inadequately protecting the public's health, 497 (89%) are very small. Fiscal viability is the foremost problem with small water systems.

Requirements placed upon water systems, particularly those related to the Safe Drinking Water Act, are becoming more complex. Small water systems often use volunteer staff with limited experience and insufficient training. As a result, some managerial and operational duties such as planning or ensuring water quality are performed incorrectly or not at all.

An increasing number of small systems are growing to the limits of their structure. Under-sized system components result in quantity and pressure problems for system users.

These issues, independently and collectively, present long-term, and in some cases acute, threats to the health and safety of system users.

Surface Water Supply. Most water systems in Washington use ground water. However, 171 public water systems, serving 2.6 million people, use surface water sources such as lakes, rivers, and streams that are above ground, exposed, and increasingly vulnerable to contamination. Contaminants include human and animal waste, pollution, and storm run-off.

Surface water sources are particularly susceptible to contamination by disease causing organisms. Chemical disinfection, such as with chlorine, is effective for most organisms, but a few, such as cryptosporidium and giardia, are resistant to disinfection. Many surface water systems also filter the water to remove these organisms, but filtration is not completely effective. In Washington, 6 public water systems serving a total of 1.6 million people use unfiltered surface water.

Intervention Points, Strategies and Effectiveness

The best protection from waterborne illness is to prevent contaminants from entering the drinking

water supply. Prevention activities, such as resource protection, small system management planning, cross-connection control, and fiscal viability establish the framework for a public water system to protect the health of those drinking the water.

The prevention of contamination is central to reducing health risk, yet contaminants continue to be found in water supplies. Prompt and appropriate action is necessary to protect the health of those drinking the water once contamination does occur. For example, affected communities are changing their agricultural and solid waste handling practices in order to reduce further nitrate contamination. Where lead is a problem, water systems are lowering the amount of lead leached from home plumbing by controlling the corrosivity of the drinking water supplied to those homes. Public water systems using surface water sources are improving the protection of their watersheds since surface water is vulnerable to any contaminant within the area draining into the source. The most practical approach is to halt the flow of contaminants into the water supply, since the removing contaminants from drinking water can be extremely difficult, very costly or not even feasible.

While each public water system is responsible for preventing health risks, community cooperation is necessary to develop the capacity for identifying and avoiding potential problems. Keys to improving public health protection are community-based education, evaluation of water system facilities and operations, direct technical assistance, and operator education. Providing individuals with information about their water supply, contaminants, and potential health risks empowers them to improve their own health protection.

Data Sources

Drinking Water Automated Information Network

For More Information

Report of the Drinking Water 2000 Taskforce

Washington State Drinking Water Program Annual Report 1995

Safe Drinking Water Hotline (800) 521-0323